FABRY-PEROT OBSERVATIONS OF CEN A

J.J.E. Hayes, R.A. Schommer* and T.B. Williams
Department of Physics and Astronomy
Rutgers University, Piscataway, NJ 08854, USA

*Visiting astronomer, NOAO-CTIO, operated by AURA
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We present Fabry–Perot spectrophotometry of the well–known peculiar galaxy Cen A (NGC 5128). The observations were carried out using the Rutgers Fabry–Perot system and a CCD as a detector. We scanned the $H\alpha$ and [NII] (λ6583) emission lines. From these data we were able to construct maps of the continuum, line emission, velocity and velocity dispersion. The velocity maps in both $H\alpha$ and [NII] have smooth gradients and twists in the line of nodes. The deprojected emission maps strongly resemble emission maps of face-on spirals. We speculate that Cen A is a merger between an elliptical and a spiral.

1. THE DATA AND REDUCTION

Our data were obtained at CTIO using the 1.5 m telescope, a GEC CCD and the Rutgers Fabry–Perot system on the nights of 8 March 1985 ($H\alpha$) and 11 March 1985 ([NII]). The image scale was $1.4''$/pixel. We used an etalon with a passband of 2.5 Å. Twenty-four images were taken of Cen A as we scanned through the $H\alpha$ emission line, from 6555–6585 Å. The same procedure was used in obtaining the [NII] data, where we obtained 24 images as well. Each image had an integration time of 600s. The data were reduced on the Rutgers Physics VAX 11/780. The data were calibrated in the same fashion as is outlined in Williams et al. (1984). To produce our maps, we have fit 65,000 $H\alpha$ line profiles and 50,000 [NII] line profiles. The internal accuracy from pixel to pixel is about 5 km/s.

2. DISCUSSION

The deprojected $H\alpha$ emission map is shown in Figure 1. We have used an inclination angle of 72^o to deproject the emission map, a value that agrees with Graham's work (1979). Figure 1 strongly looks like the spiral structure of an Sc galaxy (see M101 in the "Hubble Atlas" (Sandage 1961).

In the velocity maps the apparent line of the nodes twists from almost parallel to the dust lane in the outer parts of the galaxy ($r > 20'', 0.5kpc$), to being almost perpendicular to the dust lane in the inner portions. Bland et al.'s data (1987, these proceedings) also shows this peculiar behavior.

T. de Zeeuw (ed.), Structure and Dynamics of Elliptical Galaxies, 419–420.

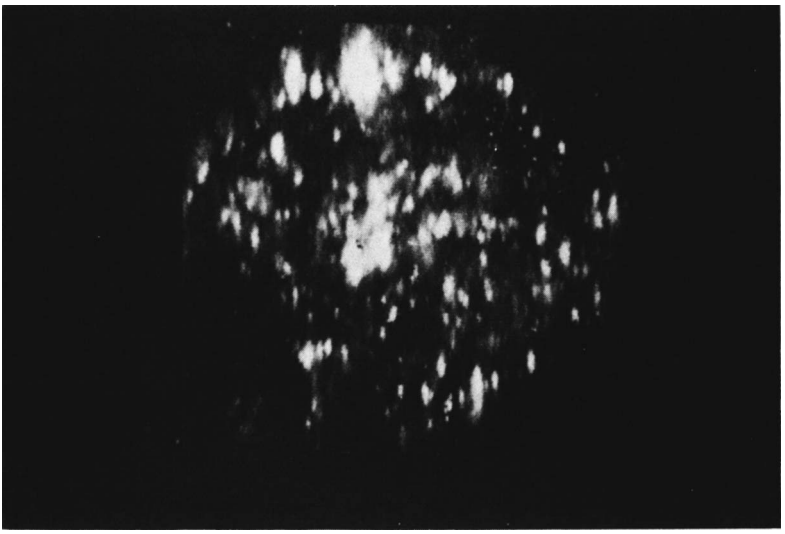

Figure 1. Deprojected Hα emission of Cen A. North is to the left, and West is to the top. The scale is 1.4″/pixel.

3. CONCLUSIONS

We conclude that Cen A is merger between an elliptical, making up the bulge, and a spiral making up the gas and dust lane, agreeing with Graham's (1979) work.

Wilkinson et al. (1986) have shown that there are no stable oblate, prolate or triaxial models which are consistent with the present appearance of Cen A. They state that there are, however, two cases (one oblate, one prolate) where the morphology of Cen A can be reproduced, both arguing for a recent encounter. Hayes (1985) has found that when a rotating stellar disk encounters a spherical potential, the disk loses its structure in only a few times 10^7 years. The twists in the line of nodes also argues for a merger, as it can be interpreted as a differentially precessing disk; a non-stable configuration. However, the uniformities seen in the inner portions of the velocity field argue that we are seeing stable inner orbits, and this would imply a triaxial potential (van Albada et al., 1982). We are left to conclude that Cen A is the product of a recent merger, with the outer disk still relaxing, a few times 10^8 to 10^9 years ago.

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REFERENCES

van Albada, T.S., Kotanyi, C.G. & Schwarzschild, M., 1982. *Mon. Not. R. astr. Soc.* **198**, 303.
Bland, J., Taylor, K. & Atherton, P.D., 1987. This volume, p. 417.
Graham, J.A., 1979. *Ap. J.* **232**, 60.
Hayes, J.J.E., 1985. Ph.D. Thesis.
Sandage, A.R., 1961 *Hubble Atlas of Galaxies*, Carnegie Institution, Washington.
Wilkinson, A., Sharples, R.M., Fosbury, R.E.A. & Wallace, P.T., 1986. *Mon. Not. R. astr. Soc.* **218**, 297.
Williams, T.B., Caldwell, N. & Schommer, R.A., 1984. *Ap. J.* **281**, 579.